Herbert R. Shaw (1930–2002)

Herbert Richard Shaw, a highly distinguished Scientist Emeritus with the U.S. Geological Survey (USGS), succumbed at home on 26 August 2002, at the age of 71, to long-term complications of congestive heart failure. He had been an AGU member (VGP) since 1968.

Herb was admired for his unstinting generosity of intellect, spirit, and resources, and the ease and frequency with which he dispensed grace, where most others merely practice civility. He shared his own ideas freely and, with an infectious enthusiasm, encouraged the efforts of colleagues and students.

Those who know of his singular intellectual virtues and contributions recognize the gravity of science's loss, which can be sensed in perusing his landmark magnum opus of 1994, *Craters, Cosmos, and Chronicles: A New Theory of Earth*. It is the most diversely based, inductive synthesis of which I am aware in the natural sciences, and as Shaw remarked, his "most self-defining intellectual product." Drawing on

In Memoriam

James Bush died this year, at age 83. He had been an AGU member (Ocean Sciences) since 1950.

Faure Hugues died this year. He had been an AGU member (Hydrology) since 1986.

Murphy Manson died this year. He became an AGU member (Planetology) in 2002.

Edgar O. McCutchen died this year, at age 78. He had been an AGU member (Ocean Sciences) since 1966.

Willard James Pierson, Jr. died on 7 June 2003, at age 81. He was an AGU Fellow (Ocean Sciences) who joined in 1948.

Recent Ph.D.s

Atmospheric Sciences

Evaluation of land surface models using ground-based point-scale measurements, **Lifeng Luo**, Rutgers University, New Brunswick, New Jersey, Alan Robock, May 2003.

Hydrology

Studies of solute transport through fractured till in Iowa, **Martin F. Helmke**, Iowa State University, Ames, William W. Simpkins and Robert Horton, May 2003.

Controls on the persistence of water within perched basins of the Peace-Athabasca Delta, northern Canada, **Daniel Lee Peters**, Trent University, Peterborough, Ontario, Canada, Terry D. Prowse and James M. Buttle, January 2003.

Ocean Sciences

Oceanographic conditions around the Galapagos Archipelago and their influence on cetacean community structure, **Daniel M. Palacios**, Oregon State University, Corvallis, Bruce R. Mate, April 2003.

Honors

Klaus Keil has received the Honorary Degree of Doctor of Science (DSc) from the University of New Mexico, Albuquerque, in recognition of his contributions to the understanding of the mineralogy and petrology of meteorites and the early history of the solar system.

Keil is director of the Hawaii Institute of Geophysics and Planetology at the University of Hawaii at Manoa in Honolulu. He is an AGU Fellow (Planetary Sciences) who joined in 1961.

Richard (Rick) Sibson has been elected a Fellow of the Royal Society of London, U.K. His research focuses on the structure and mechanics of crustal fault zones in relation to the shallow earthquake source, combining information from geological field studies of active and ancient exhumed fault zones with theoretical rock mechanics, the materials science of rock deformation, and seismologically derived information on earthquake processes. A special interest in recent years has been the role of fluids in faulting, with implications for mineralizing processes. Sibson's advances in understanding earthquake faulting have made him a world leader in his field.

Sibson is a professor in the Department of Geology at the University of Otago, New Zealand. He is an AGU Fellow (Tectonophysics) who joined in 1980.

BOOK REVIEWS

Latitude: How American Astronomers Solved the Mystery of Variation

Bill Carter and Merri Sue Carter

Naval Institute Press; Annapolis, Maryland; ISBN 1-55750-016-9; 272 pp.; 2002; $24.95.

PAGE 229

First longitude, now latitude. From *Latitude*'s title we cannot help thinking of Dava Sobel's recent bestseller, *Longitude*. I suppose it's unlikely to be such a moneymaker, but this delightful new book by Bill and Merri Sue Carter, a father and daughter team, is similar to Sobel's book. Both are physically small, with short chapters, which makes for a quick read. And both have a clear hero: John Harrison and his chronometers for longitude; and Seth Carlo Chandler Jr. and his almucantar for latitude. Both books eschew academic-style footnoting, although *Latitude* does list a few useful sources for each chapter and provides a comprehensive list of Chandler's astronomical publications.

Chandler's name is known to most AGU members for its association with the 14-month wobble of the Earth's pole. He also discovered the slightly smaller annual wobble, and an argument can be made that he was the principal discoverer of polar motion, or latitude variation, in general.

Chandler (1846–1913) was born in Boston. Although his formal education ended in 1861 upon graduation from Boston English High School, his true astronomical training commenced while he was working as a computing assistant, first to Benjamin Pierce, and then to Benjamin Apthorp Gould, two of the great names in 19th century American astronomy. Gould was then at the U.S. Coast Survey, and Chandler joined him there immediately after high school. He was soon an expert in all facets of geodetic astronomy. Then, after marriage in 1870, Chandler abruptly left the Survey and took a position as an actuary in an insurance company. He nonetheless continued scientific work on his own time, making astronomical observations from his home or at the Harvard College Observatory, and eventually publishing a long string of papers in leading journals, including Gould's *Astronomical Journal*. Much of that work concentrated on studies of variable stars, on the orbits of comets, and, of course, on the latitude problem.

For well over a century, the precise determination of latitude appeared to be plagued by intractable systematic errors. Determinations that should have been accurate to perhaps 0.02 arcseconds could not be repeated to better than ±0.2 arcseconds. Real but subtle effects like aberration, nutation, and parallax compounded the problem. Great scientists like Sir George Airy had designed special instruments to overcome perceived measurement problems, only to meet with failure. It was Chandler who, in 1891 and 1892, first clearly showed what was occurring: the pole itself is in motion relative to any observatory and it is moving at two fundamental frequencies.

Continuing onward, Chandler re-analyzed Airy's and other historical data, going back even to James Bradley's path-breaking observations of the 1720s; and he showed how these old data had embedded within them the same two-term polar motion. The old data were thus redeemed. In short order, Airy's suspect instrument was taken out of mothballs and put back into service; its merits for studying the polar motion were suddenly recognized. Within a few years, the International Latitude Service, the forerunner of today's International Earth Rotation Service, was founded. Chandler was awarded medals and honorary degrees.

The Carters tell this story admirably well, with lots of interesting personal details exhumed from unpublished Chandler family papers and letters. There are also valuable discussions of other relevant figures, such as Chandler's mentor, Gould, and especially, Simon Newcomb, who soon after Chandler's discovery gave the correct explanation for the wobble's observed period.

I spotted but a few minor errors and irritants: Ben Franklin received the Copley Medal in 1753, not 1731; Nevil Maskelyne died in 1811, not 1764. I found irksome the insistence on parenthetically converting all units between English and metric, including even "a few meters (several feet)." Surely anyone intelligent enough to read a book about polar motion is in no need of such a crutch. I could have done without the 21-page fictional prologue.

And, finally, the Center for the History of Physics, which houses many Chandler papers, is no longer in New York. For some years now it has been located in College Park, Maryland.

Near the end of *Latitude*, the Carters bring up an interesting, but somewhat controversial, point. While all agree on crediting Chandler with discovery of the true nature of polar motion, who should be credited with discovering that the pole actually moves at all? The authors press Chandler's priority here as well. Others argue for the German astronomer Karl Friedrich Küstner. In 1888, Küstner did publish persuasive evidence for variation in the latitude of the Berlin Observatory, while conveniently ignoring Chandler's prior 1885 work at Harvard. Peter Brosche recently called Küstner's work a "turning point" in establishing polar motion, partly because it most forcefully convinced the astronomical community.

To some extent, both sides are right. Chandler himself was probably not completely convinced of polar motion when he published his 1885 paper. Moreover, part of the advancement of science is convincing one's peers; unfortunately, more often than we might like, it may take more than just the plain facts for a "turning point" to occur.

Acting against Chandler: he worked in the scientific backwoods of 19th century America, without proper academic credentials, using an unfamiliar instrument of his own design. All the more reason, I would say, for calling the dominant term in polar motion the Chandler Wobble.

—RICHARD D. RAY, NASA Goddard Space Flight Center, Greenbelt, Md.

Deformation Mechanisms, Rheology, and Tectonics: Current Status and Future Perspectives

S. DEMEER, M. R. DRURY, J. H. P. DEBRESSER, AND G. M. PENNOCK, EDITORS

Geological Society of London Special Publication 200; ISBN 1-86239-117-3; 416 pp.; 2002; $160.

PAGE 229

The geosciences have come a long way in the last two decades as geologists, seismologists, numerical modelers, experimentalists, and materials scientists have interacted to dramatically increase our understanding of how the interior of the Earth deforms. It is remarkable to look back at the early days of plate tectonics and realize how little we knew about basic deformational processes at that time. Since then, we've seen dramatic advances in our understanding of how processes at the atomic level contribute to tectonic systems; and ultimately, we can hope that the combination of experimental rock deformation, numerical simulation, and studies of naturally deformed rocks will help us understand the full geodynamics of lithospheric deformation.

From that perspective, it is great to see a book like this published, because it brings into focus many outstanding problems in our understanding of ductile deformational processes in the Earth. *Deformation Mechanisms, Rheology, and Tectonics: Current Status and Future Perspectives* includes several review papers that provide a good perspective on how far we have come, but the book also points out just how far we have to go in addressing some of these problems. Perhaps most important, the volume has several contributions on what is probably the most overlooked topic in the study of deformational processes: pressure solution. The book is a bit Eurocentric, but people in North America will, in general, benefit most. North Americans tend to focus more on large-scale tectonic processes and less on the details of how solid-state flow actually works; while in Europe, the emphasis is generally reversed.

As the catch-all title implies, the book is a collection of papers covering a broad range of topics, but one common theme is carried throughout: modern attempts to constrain the mechanics of lithospheric deformation at scales ranging from the atomic level to tectonics. The emphasis, however, is on ductile deformational processes.

This particular volume is the outgrowth of a conference held in Noordwijkerhout, Norway, in April 2001; the twelfth in a series. Several landmark publications have come out of previous conferences, with most published as special issues of either *Tectonophysics* or the *Journal of Structural Geology* (JSG). Examples I was very familiar with were the 1984 JSG volume, "Planar and linear fabrics of deformed rocks" and the 1992 JSG issue, "Mechanical instabilities in rocks and tectonics," but others would probably find other members in the series particularly significant.

The editors have divided the papers into four categories: the effect of fluids on deformation (primarily pressure solution studies); the interpretation of microstructures and textures (texture here referring to the materials science terminology where texture refers to lattice preferred orientations); deformation mechanisms and rheology of crust and upper mantle materials (curiously, most of the papers are on calcite rocks, which makes the title of this section somewhat deceptive, although there are two more general papers); and crust and lithosphere tectonics. These topical papers are preceded by an excellent review of the volume by the editors, as well as a summary of "where we are and where we need to go" in the opinion of the editors.

I highly recommend that potential buyers of this book read the introductory paper by the editors before making a decision. The most obvious buyers are those interested in pressure solution (the first third of the book is devoted to the topic and has some excellent papers); people interested in a good review of the state of the art in microstructure/deformation mechanisms (there are several nice review papers, including some interesting ones on recent numerical simulations of textural development in rocks); and people who happen to find this unique collection an appealing combination of topics (for example, despite the broad spectrum of topics, I found myself carefully reading papers within all four divisions of the volume, but that may be personal oddity).

Unfortunately, the book is a bit pricey, so it is undoubtedly beyond the budget of many, particularly students.

—TERRY PAVLIS, University of New Orleans, La.